Notice of Allowability	Application No.	Applicant(s)	
	10/064,191	PAPPONE, DANIEL	
	Examiner	Art Unit	
	Ayal I. Sharon	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/11/2006*.

2. ☒ The allowed claim(s) is/are *1-15*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Introduction

1. Claims 1-15 of U.S. Application 10/064,191, originally filed on 06/20/2002, are currently pending.

Examiner's Statement of Reasons for Allowance

2. Claims 1-15 are allowed. The following is an examiner's statement of reasons for allowance for claims 1-15.

3. The prior art referred to in this Reasons for Allowance is as follows:

    a. King, T. et al. "Framework for Risk-Informed Changes to the Technical Requirements of 10 CFR 50." Draft, Revision 2. August, 2000. Cited by Applicant in the IDS filed 09/03/2002. ("**Framework**").

    b. McCalley, J.D. et al. "An Overview of Risk-Based Security Assessment." IEEE Power Engineering Society Summer Meeting. July 1999. Vol.1. pp.173-178. ("**McCalley**").

    c. Poulter, Susan. "Monte Carlo Simulation in Environmental Risk Assessment – Science, Policy and Legal Issues." Risk: Health, Safety & Environment. Vol.9, Winter 1998. http://www.piercelaw.edu/risk/vol9/winter/Poulter.pdf. ("**Poulter**").

d. Nuclear Energy Institute, "Nuclear Power Plant Regulation." October 2001. http://www.nei.org/documents/Status_Report_Regulation.pdf. ("**NEI**").

e. U.S. Patent 6,697,447 to Casillas et al. ("**Casillas 1**").

f. U.S. PG-PUB 2004/0013220 to Casillas et al. ("**Casillas 2**").

4. In regards to Claim 1, Framework teaches the following limitations:

> 1. A risk-informed method for safety analyses of nuclear power generating systems, said method comprising:
>
> ordering events by an initiating event frequency;
>
> defining an initiating event frequency threshold value;

Examiner notes that Fig.3-1 lists three categories of event initiating frequencies: (1) frequent initiators, (2) infrequent initiators, and (3) rare initiators.

> defining acceptance criteria having an adjusted amount of conservatism, wherein the amount of conservatism is a function of the initiating event frequency; and

The Framework reference teaches the use of a "safety margin" (see especially p.4-1):

> The treatment of uncertainty from the design basis perspective involves the notion of safety margin. Colloquially, terms like safety margin and safety factor imply a measure of the conservatism employed in a design or process to assure a high degree of confidence that it will work to perform a needed function.

And also see especially p.4-2, right column of the Framework reference:

> Safety margin is imposed to account for uncertainties in data and models by conservatisms placed in acceptance criteria and methods for demonstrating compliance with acceptance criteria. The approach preferred for the Option 3 study is (1) to specify reasonable safety margin in acceptance criteria based on probabilistic considerations and risk insights, and (2) to use best-estimate code calculations with uncertainty propagation to demonstrate compliance based on a computed 95th percentile. When this approach is precluded, an attempt will 'be made to achieve an equivalent level of safety margin in order to avoid excessive conservatism.

In regards to the following limitations,

> determining if an event has an event initiating frequency at or above the threshold value;
>
> determining if an event has an event initiating frequency below the threshold value;

Examiner notes that Fig.3-1 of the Framework reference lists three categories of event initiating frequencies: (1) frequent initiators, (2) infrequent initiators, and (3) rare initiators.

In regards to the following limitations,

> comparing the event analysis result to the defined acceptance criteria to determine if the nuclear power generating system meets licensing requirements; and
>
> outputting a comparison result that indicates if the nuclear power generating system meets licensing requirements..

Examiner notes that p.3-2 of the Framework reference teaches the following:

> "The measures and guidelines proposed for this purpose are summarized in Figure 3-1. They are generally consistent with those in current use (e.g., (Ref. 11)(Ref. 12))."
>
> Where Reference 11 is USNRC, SECY-99-007, "Recommendations for Reactor Oversight Process Improvements," January 8, 1999.
>
> Reference 12 is USNRC, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, July 1998.

However, in neither the Framework reference, nor the other references,

expressly teach the following limitations:

> determining if a nuclear power generating system meets licensing requirements by:
>
> analyzing an event by a deterministic safety analysis methodology when the event has an event initiating frequency at or above the threshold value; or
>
> analyzing an event by a probabilistic risk assessment methodology when the event has an event initiating frequency below the threshold value to produce an event analysis result;

While the Framework reference teaches (see especially p.2-2, right column) that:

> The structuralist or traditionalist model asserts that defense-in-depth is embodied in the structure of the regulations and in the design of the facilities built to comply with those regulations. ...
>
> In contrast, the rationalist (or risk-based) model asserts that defense-in-depth is the aggregate of provisions made to compensate for uncertainty and incompleteness in our knowledge of accident initiation and progression. This is made practical by the ability to quantify risk and estimate uncertainty using PRA [probabilistic risk assessment] methods.

And while the Framework reference further teaches (see especially p.2-3, left column, first para.) that:

> The approach adopted herein recognizes the relevance of both structuralist and risk-based considerations.

However, the Framework reference does not teach any preference for either the deterministic approach or the risk-based approach, nor a threshold for using one technique instead of the other.

The McCalley reference teaches away from the use of a threshold by expressly teaching a preference for risk-based analysis over deterministic analysis. The McCalley reference teaches that a purely deterministic approach leads to overbuilding and underutilization (See p.175, Section 3 "Why Change"", para.1. Emphasis added):

> The deterministic approach has served the industry well; it has provided high reliability levels without requiring excessive study effort. **Yet there has been a real and tangible price to pay for using this approach**: solutions tend to be overly conservative, due to the emphasis of the most severe, credible event. Consequently, **existing facilities are not fully utilized**, from an operating perspective, **and the system becomes overbuilt**, from a planning perspective.

In addition, McCalley further teaches the motivations to shift from a deterministic approach to a risk-based approach (see p.175, left column, last para.):

> It is in this environment of frequent stressed system operation that the weaknesses of the deterministic approach become salient. One glaring weakness is that it is difficult to economically evaluate the security level.

Moreover, the McCalley reference further teaches that another problem with the deterministic approach is that it does not account for event frequency (See p.175, right column, emphasis added):

> For some problems such as overload and voltage security, measures of event security do exist ... and these measures are used within deterministic assessment to judge security level. Yet these measures **do not account for event occurence frequency**. Application of the **deterministic approach accepts the implicit assumption that all events in the contingency set occur with equal frequency**. However, even if the contingency set includes only N-1 events, significant variation in occurrence frequently may exist.

McCalley also teaches yet another flaw of the deterministic approach (See p.175, right column):

> The deterministic approach bases decisions on the performance of the most restrictive event(s). Less restrictive events have no influence on the decision.

In addition, McCalley teaches (See p.175, last para. to p.176, 1st para. Emphasis in original):

> These [deterministic] methods were ***acceptable*** under the earlier industry structure because stressed operation occurred infrequently, and conservatism was embraced. These methods were perceived as ***necessary*** because of the difficulty in assessing uncertainty via performing increased computations or obtaining additional data.
>
> Today, transmission and generation owners are keen on fully utilizing equipment to maximize the return on their investment in facilities. ... Simultaneously, computational speed has dramatically increased, and fast computers available today can effectively be used to probe a wider range of operating conditions and consequently reduce uncertainty.

> Finally, obtaining appropriate data ... can be viewed as a decision-making problem itself, where one employs probabilistic decision paradigms for deciding whether to spend resources for gathering that data by comparing its worth to the cost of the necessary resources.

The Poulter reference, in contrast to the Framework and McCalley references, teaches that there are advantages and disadvantages to a risk-based approach (see p.13, last para. to p.14, first para.):

> The proponents recognize that Monte Carlo [risk-based] methods have some advantages as well as advantages. They require more data ... Clearly, they require a greater level of mathematical and computer sophistication ...As with any use of a mathematical model, the results are only as good as the assumptions ... The greater complexity also presents challenges to effective risk communication and public participation in regulatory proceedings ..."

The Poulter reference also teaches that "these [Monte Carlo] methods raise many policy and legal issues which may be obscured by the complexity of the methods." (See p.26, "Conclusion"). Yet the Poulter reference does not expressly teach the use of a threshold for differentiating between the use of deterministic and risk-based methods.

The NEI reference presents yet another opinion regarding the relative merits of deterministic and risk-based analyses (See p.9):

> The existing deterministic requirements, to which the plants were designed and licensed, served well in providing a robust design with a strong defense in-depth. They do not work well in pointing out where to place operational focus.
>
> There is growing support within the industry and the NRC to move toward a risk-informed, performance-based regulatory process, made possible by the development of an analytical tool called "probabilistic safety assessment."

Therefore, the four references present different opinions as to the relative merits of deterministic and Monte Carlo methods. The Framework reference "recognizes the relevance of both structuralist and risk-based considerations". The McCalley reference finds the risk-based method to be superior to the deterministic method. The Poulter reference teaches that both methods have unique advantages and disadvantages. The Nei reference teaches that deterministic methods are preferable for plant design, while risk-based methods are preferable for design operation.

Examiner accepts Applicant's persuasive arguments that the cited prior art does not teach the claimed limitations. In particular, Examiner finds the following argument to be persuasive (see p.11 of Applicant's amendment filed on 10/11/2006):

> Applicant submits that the method recited in Claim 1 overcomes the shortcomings of Frameworks arbitrary assignment of assessment methodology by actively determining the event initiating frequency and determining if this event initiating frequency is over a threshold value before determining the assessment methodology that is used to determine if the licensing requirements are met.

5. Moreover, the Casillas 1 and Casillas 2 references, which are assigned to the assignee of the instant application, and which share the same Figure 1 as in the instant application, also do not expressly teach the claimed limitations.
6. Independent claims 6 and 11 are allowed for the same reasons as independent claim 1. Claim 6 is a system claim, and claim 11 is a computer program claim that recites limitations equivalent to those recited in method claim 1.

7. Dependent claims 2-5, 7-10, and 12-15 all depend from allowable claims, and therefore are also allowable.
8. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a bi-week, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753.

Any response to this office action should be faxed to (571) 273-8300, or mailed to:

USPTO
P.O. Box 1450
Alexandria, VA 22313-1450

or hand carried to:

USPTO
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon
Art Unit 2123
November 17, 2006

PAUL RODRIGUEZ
SUPERVISORY PATENT EXAMINER
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